

BACHELOR OF MECHANICAL ENGINEERING EXAMINATION, 2025

(3rd Year, 1st Semester)

Sub : Optimisation Techniques for Engineering Design (elective)

Full Marks : 100

time : 3 hrs

Answer any five questions (20 X 5 = 100)

1. a) Compare **feasible design** and **optimum design** .
 b) Develop an N.L.P for design optimization based on any design problem.
 c) Classify optimization techniques.
 d) Compare **Local optima** and **global optima**.
 4+7+5 +4
2. a) Discuss the basic principles of **Secant** method used in optimization techniques.
 b) Explain the algorithm for **Interval halving** method of optimization.
 c) Apply **Golden Section method** (two iterations) to find out optimum solution for the following objective function ?

$$f(x) = x^3 + 2x + 3$$

 6+6+8
3. a) Explain **Simplex method** for optimisation.
 b) Explain **Cauchy's Steepest Descent** method for multivariable optimization. Why Marquard method is more efficient ?
 c) Explain **evolutionary algorithm** for multi variable optimisation ?.
 6+8+6
4. a) Explain the exterior and interior methods in constraint optimisation".
 b) mention two penalty functions for interior method ? Describe optimality criteria for equality constraints.
 c) Explain the significance of Lagrange's multiplier in interior and exterior method.
 6+8+6
5. a) Explain **genetic algorithm** used for optimisation.
 b) Write down the working principles of **Ant Colony Optimisation**
 10 +10
6. a) Explain **Particle swarm optimization** technique .
 b) Explain the algorithm for **Simulated Annealing** .
 10+10
7. a) Explain "Pareto optimal solution".
 b) Explain weighted Sum method for multivariable optimization.
 c) explain any technique for finding "non dominated solution".
 6+8+6
8. a) Explain the method of Artificial Neural Network for three inputs and two outputs with two hidden layer.
 b) Explain back-propagation algorithm with a suitable example.
 10 +10